
S/HMO Versus TEFRA HMO Enrollees: Analysis of Expenditures

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This study compares expenditures on health care services for enrollees in a social health maintenance organization (S/HMO) and a Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA)-risk Medicare health maintenance organization (HMO). In addition to the traditional Medicare services covered by the TEFRA HMO, the S/HMO provided a long-term care (LTC) benefit and case management services for chronic illness. There do not appear to be any overall savings associated with S/HMO membership, including any savings from substitution of S/HMO-specific services for other, traditional services covered by both the S/HMO and the TEFRA HMO.

INTRODUCTION

A topic of perennial interest in health services research is the potential cost savings that could be realized from the substitution of community-based services for inpatient care or nursing home care, particularly for the subgroup of elderly patients who have multiple admissions due to chronic illnesses, persons with exceptionally long stays, and those with high-cost episodes during terminal illnesses (Eggert and Friedman, 1988). The choice of appropriate treatment

settings and types of care may be thought of as the choice of a cost-effective combination of “inputs,” used to promote and maintain the health of a population, including treatment of chronic illnesses. Choice of appropriate inputs is more likely to occur when there is an organization that is able to coordinate the use of different inputs and when that organization has a financial incentive to choose the most cost-effective input mix. One delivery system model that has an interesting mix of organizational structure and incentives is the S/HMO. HCFA has supported research on S/HMOs for more than a decade and continues to support the S/HMO model through demonstration projects.

The purpose of this study is to compare expenditures on health care services for enrollees in a S/HMO and a TEFRA-risk Medicare HMO. Both the S/HMO and the TEFRA HMO were operated by the same parent organization, Group Health, Inc. (GHI). Medicare Partners (under the name Seniors Plus) was the S/HMO demonstration project offered jointly by GHI and the Ebenezer Society of Minneapolis/St. Paul (Twin Cities) and was one of four original S/HMO demonstration projects. Because the TEFRA HMO and S/HMO were offered by the same organization, many characteristics of the two plans were held constant, and this analysis was able to focus on the marginal effect of the S/HMO’s coverage of additional LTC and case management services. Seniors Plus differed from the TEFRA HMO in that it provided a LTC benefit plus

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case management services for chronic illness in addition to the full package of Medicare inpatient and ambulatory services. However, enrollees in the two plans used the same physicians and hospitals. Because the S/HMO was capitated for both acute care services and LTC services beyond the basic Medicare benefit, the S/HMO had an incentive to make cost-effective substitutions of one type of care for another, e.g., substitution of home care for nursing home care or nursing home care for acute hospital care.

The S/HMO demonstration has moved into its second phase, with additional demonstration sites, and enrollment in TEFRA HMOs continues to grow. Evidence that S/HMOs could reduce acute care costs, while providing additional LTC benefits in a TEFRA HMO setting, could have a dramatic impact on the availability of LTC benefits nationwide. HMOs may be willing to add services such as case management even without additional Federal dollars if the cost can be covered by reduced acute care costs or reasonable supplementary premiums.

LITERATURE REVIEW

Many previous demonstrations have focused on service substitution and several have investigated the substitution of community-based services for inpatient care for the elderly. Kemper, Applebaum, and Harrigan (1987) reviewed 16 demonstrations that were funded through special waivers of the Medicare and/or Medicaid programs from 1972 through 1984. Weissert, Gredy, and Pawelak (1988) reviewed 31 studies carried out over the past three decades, under a variety of auspices and funding sources. Both reviews examined the extent to which the commu-

nity-based LTC projects were able to reduce both nursing home and hospital use and their ability to meet their stated goals of achieving overall cost savings. In both of these reviews, the authors conclude that hospital use has been largely unaffected by the demonstrations. Though some demonstrations were successful in reducing hospital and nursing home utilization, only 7 of 19 studies showed cost savings, and the other 12 showed cost increases in the treatment group. The effects of the projects on health status and well-being were mixed (Weissert, Gredy, and Pawelak, 1988). The effects of the programs on survival were generally positive in the few cases that were statistically significant. The statistically significant findings for activities of daily living (ADLs) and instrumental activities of daily living (IADLs) were approximately one-half positive and one-half negative, but generally insignificant.

In an updated review of community-based demonstrations, including five additional programs, Weissert and Hedrick (1994) noted that "results of these studies have been remarkably robust and consistent" in showing that community-based LTC programs have little or no effect on survival, functional health, or use of nursing homes or hospitals. Another recent meta-analysis, however, concluded that home care programs do reduce hospital days, with estimated average savings in hospital costs ranging from approximately \$2,600 to \$6,300 per patient (Hughes et al., 1997).

The S/HMO demonstrations were designed to test the feasibility of offering a community-based LTC benefit package in conjunction with a comprehensive package of hospital and medical care services, through a capitated, at-risk delivery system or HMO (Leutz et al., 1985).

Harrington and Newcomer (1990) list four basic organizational and financing features of the S/HMO model:

1. S/HMOs provide a full range of acute and chronic care services to Medicare beneficiaries who enroll voluntarily and pay a fixed monthly premium. In addition to the benefits of the TEFRA Medicare HMO, the S/HMO offers coverage of a full package of community-based social support services for the chronically ill and some nursing home coverage beyond that covered under Medicare criteria.
2. S/HMOs provide coordinated case-management for members meeting specified disability criteria.
3. S/HMOs were designed to enroll both well and functionally impaired elderly.
4. S/HMO services are financed through funds pooled from Medicare, Medicaid, and monthly enrollee premiums. An important point is that the S/HMOs receive 100 percent of Medicare's HMO payment rate (the adjusted average per capita cost) for all S/HMO enrollees and also receive the institutional payment rate for enrollees who are deemed "nursing home certifiable" according to predetermined Medicaid disability criteria, even if the enrollee remains in the community.

In 1985, S/HMO demonstration projects became operational in four sites: Seniors Plus (Minneapolis, Minnesota), Kaiser-Permanente Medicare Plus II (Portland, Oregon), Elderplan (Brooklyn, New York), and SCAN Health Plan (Long Beach, California). Two of the four sites, Seniors Plus and Kaiser-Permanente, were sponsored by large HMOs that offered a standard TEFRA HMO to Medicare beneficiaries as well as the S/HMO product.

The four demonstration sites began enrolling and providing services to members in early 1985. The preliminary evaluation of the demonstration focused on the

marketing problems and organizational structure issues faced by the plans during their early startup phase (Newcomer, Harrington, and Friedlob, 1990). Initial experience showed the difficulty faced by the plans in educating potential enrollees on the limitations on LTC services covered by Medicare and most supplemental insurance plans and, therefore, of the value of the new S/HMO LTC benefits. Harrington, Newcomer, and Preston (1993) found that disenrollment rates in the plans averaged 8.6 percent for the first 3 years of operation. About one-quarter of the disenrollees joined another HMO, and three-quarters disenrolled to the fee-for-service (FFS) sector. Disenrollment rates were lower in the S/HMOs that were run by organizations also offering TEFRA HMOs (including the one in this study). Overall, the S/HMOs, like TEFRA HMOs, experienced favorable enrollment and disenrollment, relative to the FFS sector (Health Care Financing Administration, 1996).

The S/HMOs had been at risk for utilization of both acute and LTC services since mid-1987 and thus, had a financial incentive to substitute in-home services for institutional care (and nursing home care for hospital care) whenever this would be cost-effective. Use of services and expenditures varied across the four sites. All four S/HMOs reported losses in the first 3 years of operation (Health Care Financing Administration, 1996), but two S/HMOs, including the Group Health S/HMO, had positive financial balances in the first year of full financial risk (Harrington and Newcomer, 1990).

Manton et al. (1996) compared pre-enrollment expenditures for subsequent S/HMO enrollees with those of continuing FFS beneficiaries. Among healthy persons, costs for subsequent S/HMO enrollees were lower than for continuing FFS beneficiaries. Among the frail elderly,

however, costs for subsequent S/HMO enrollees were higher than costs for FFS beneficiaries. In an analysis of post-enrollment costs, using an instrumental variable estimator, Manton et al. found that the two HMO-based plans (Kaiser and Seniors Plus) were able to contain costs (relative to the FFS sector) more effectively than the plans sponsored by LTC organizations (Elderplan and SCAN).

The S/HMO model can be contrasted to other demonstrations in the early 1990s, as shown in Table 1. Several LTC demonstrations deserve special attention: the Channeling demonstrations, On Lok, and ACCESS. In all of these demonstration projects, the control groups used services available in the community, on an FFS basis (Kemper, Applebaum, and Harrigan, 1987).

The Channeling Financial Model was the most similar to the S/HMOs in the type and extent of LTC services provided and the degree to which the project case manager had control over the authorization and purchase of all services included in the clients' home care plans. However, the organizations in the Channeling projects were not financially responsible for acute medical services. Hospital days were lower for the treatment group than the comparison group in the Channeling demonstration, but the difference was not statistically significant.

The On Lok program has gone through several variations. In the initial phase of the demonstration, On Lok was responsible for both the acute care medical services and LTC service authorization and delivery. The program received payment from Medicare through a capitation mechanism similar to the system used by Medicare for HMOs, but in the initial demonstration, this payment was retrospectively adjusted to reflect actual costs incurred. The initial demonstration also differed from the S/HMO projects in that

only persons already impaired and meeting the State guidelines for nursing home admission were eligible. Therefore, it lacked the flexibility the S/HMOs have of setting their own eligibility criteria for receipt of LTC services. An early evaluation found that the treatment group's mean use of hospital days was less than that of the control group, but the difference was not statistically significant (Capitman, 1986). After the 3-year initial period, On Lok and subsequent PACE sites were at full financial risk.

The ACCESS demonstration had two variations, the Medicare/Private Pay model and the Medicare/Medicaid model. Under both models, the purpose of the demonstration was explicitly to achieve overall cost savings for health care services by substituting less expensive LTC services for both nursing home care and hospital care (Berkeley Planning Associates, 1987). The estimated cost savings of the Medicare/Medicaid model was \$3,081 per enrollee per year, though this estimate was not statistically different from zero. The reduction was achieved, in part, by an intentional substitution of skilled nursing facility (SNF) services for hospital days, including negotiation with nursing homes to provide more intensive services than usually provided in the nursing home setting in return for a higher payment rate for these services (Weissert, Gredy, and Pawelak, 1988). These authors note that it is unclear whether or not the ACCESS result could be achieved in another setting, because the number of hospital days attributed to patients backed up in hospitals awaiting nursing home placement is higher in New York State than elsewhere in the Nation.

Several elements of the S/HMO model made it a more powerful intervention than previous home and community care demonstrations, thereby increasing the model's likelihood of providing cost-effective care.

Table 1
Comparison of Benefits of Other Demonstrations and Programs Relevant to this Study

Plan Characteristic	S/HMO	PACE	LTC Demos ¹	Medicare, No HMO	TEFRA HMO	Medicare and Medicaid
Elderly Target	65 or over	65 or over	Low income and at risk	65 or over	65 or over	65 or over and low income
Benefits	Medicare benefits; expanded health benefits; community caps; and limited nursing home	All Medicare and Medicaid benefits	Community LTC with caps; hospital and nursing home under usual Medicare, private, and Medicaid funding	Hospital care; physician care; limited nursing home and home care	All Medicare benefits and other health benefits	All Medicare and nursing home and community LTC as covered under State plan
Consumer Costs	Monthly fee plus copayments	None	None	Deductible and copayments; may buy medigap and/or LTC insurance	Depends upon market; there may be an out-of-pocket premium and copayments for some services	None; patient indigent
Providers	Capitated organization	Capitated organization	Lead agency plus contract agencies	Fee-for-service	HMOs	Fee-for-service
Financial Risk for Provider	S/HMO at risk	PACE provider at risk	None	None	HMO at risk	None
Case Management	Expanded benefits managed; acute care may be managed	Acute and LTC managed	Community LTC managed but no link to acute	No case management	Case management for acute care	Little case management; some States have case management as Medicaid benefit; some have case management as Medicaid waiver benefit

¹ Section 2176 waiver demonstrations, including the LTC Channeling Demonstration.

NOTES: S/HMO is social health maintenance organization. PACE is Program of All-Inclusive Care for the Elderly (based on the On Lok model). LTC is long-term care. HMO is health maintenance organization. TEFRA is Tax Equity and Fiscal Responsibility Act of 1982.

SOURCE: Dowd, B., et al., Minneapolis, Minnesota, 1999.

First, combining the authorization and provision of both acute care services and LTC under one organizational model allows better coordination between service providers and a broader scope of control for the organization as a whole. Secondly, placing the organization at risk for the cost of acute and LTC services covered by the plan creates a stronger financial incentive than in previous demonstrations to ensure that care is provided in the least costly environment that is able to meet the member's needs.

The comparison in this study, between a S/HMO and a TEFRA HMO operated by the same parent organization, differs in two important ways from earlier comparisons of S/HMO enrollees and FFS beneficiaries. First, the data allow us to observe the true marginal effect of S/HMO services, because other characteristics of the health plan are held constant by virtue of the fact that the organization providing non-S/HMO services is the same organization in both the S/HMO and TEFRA

HMO. It is important to note that this study could be done only at the Kaiser or GHI site. Second, because the physician panels, clinic locations, coverage of non-S/HMO services and other health plan characteristics are identical in the two plans, the problem of self-selection bias is reduced to selection based on the availability of services covered only by the S/HMO (LTC home services, special durable medical equipment, and medical transportation and day care services) and not the TEFRA HMO. Interestingly, however, only 24 percent of S/HMO enrollees in this study used any S/HMO-specific services.

STUDY SETTING

The GHI study setting is unique because it was the only first-generation S/HMO site that made comparison data on its TEFRA HMO enrollees available for independent analysis. GHI is a non-profit, member-governed, multispecialty, staff-model group practice and managed care delivery system offering a range of HMO and other benefit plans. GHI was established in 1957 and, at the time of the study, enrolled more than 300,000 members. (In 1993-1994, GHI merged with Medcenters to become HealthPartners, Inc.) In 1992, there were 17,000 TEFRA HMO enrollees and 3,500 S/HMO enrollees. These members were served by more than 325 salaried primary care and specialty physicians on the medical staff, as well as nurse practitioners, physician extenders, midwives, and other health professionals in 55 medical and dental centers throughout the Twin Cities and surrounding area. Also available were 225 contracted primary care physicians and 800 contracted specialists. GHI managed care in a variety of ways. Hospital expenditures were managed through the use of specific treatment protocols for high-volume and high-cost diagnoses and procedures,

length-of-stay criteria, concurrent review, and discharge planning. Management of ambulatory care was accomplished through screening and prevention programs, coordination of care by the primary care physician, in-house laboratory tests, use of a central After-Hours Care Team to reduce emergency room use, and provision of home care services.

The S/HMO demonstration was implemented as a joint venture between a large and well-established HMO (GHI) and the Ebenezer Society, which has been serving the elderly in the Minneapolis area since 1917. At the time of the study, Ebenezer managed 12 senior housing facilities with approximately 1,100 units, owned 4 nursing facilities with 800 beds, and operated a range of community-based LTC programs, including a Medicare-certified home nursing program, a homemaker/health aide program, 3 adult daycare centers, a senior companion program, a protective services program, and transportation services with a fleet of more than 30 vehicles.

Covered LTC services at Seniors Plus included homemaking services, personal care services, public health nursing, in-home physical, occupational, and speech therapy, adult day care, and non-emergency medical transportation. Seniors Plus enrollees were eligible for up to \$6,000 of covered services per year, with a member copayment of 20 percent. Chronic care nursing home stays were covered at 80 percent for 21 days per stay. This is over and above any SNF stays that would have been covered under Medicare criteria. (Skilled stays were covered at 100 percent for up to 180 days per stay.) All members who were eligible for the LTC benefit were assigned a case manager who was responsible for carrying out comprehensive in-home assessments and working with the member and family to develop a

care plan for supportive services. The out-of-pocket premiums were \$34.95 for the S/HMO and \$19.95 per month for the TEFRA HMO.

Not all members of the S/HMO received the LTC benefits and case management. In three of the four S/HMO sites, eligibility for LTC services was strictly limited to those people who qualified under their State LTC pre-admission screening guidelines. The LTC benefit at Seniors Plus was available to members who exhibited a medically related functional deficit (i.e., inability to dress oneself) and lacked other resources to meet this need (i.e., no informal caregiver available to provide the level of assistance needed on an ongoing basis) or those who met the State's nursing home pre-admission screening eligibility criteria. The case manager was responsible for authorizing any needed in-home services under either the post-acute Medicare benefit or the LTC benefit. Case managers at Seniors Plus also communicated regularly with the member's GHI physician to ensure coordination of in-home services with the medical treatment plan. This active involvement of the case managers with the medical system was an important component of the organizational model chosen by Seniors Plus and was more strongly emphasized at Seniors Plus than at the other S/HMO sites (Yordi, 1988; Abrahams et al., 1989).

Seniors Plus also had the ability to negotiate special services and special rates with all service providers, including nursing homes. Seniors Plus obtained post-acute transitional care similar to that provided in the ACCESS demonstration from one of the Ebenezer Society nursing homes specializing in that service.

SAMPLE AND DATA

The data for the study cover 2 years, roughly 1989 and 1990. The period of observation begins a year after the S/HMO assumed full financial risk. The primary data consist of 2 years of expenditure data and a beneficiary survey administered after the first year. The fact that the beneficiary survey was administered in the middle of the 2-year observation period means that beneficiaries had to survive and remain enrolled during the first year of observation but not the second. The population for the S/HMO sample was active S/HMO members over age 65 as of January 1989 who were still living during 1990 when the beneficiary survey was administered ($N = 2,765$). (S/HMO enrollees are surveyed at the time of initial enrollment and each year on the anniversary of their enrollment.) The population for the TEFRA HMO sample consisted of a random sample of current members over age 65 as of January, 1989, who were still living in February, 1990, when a special survey was administered ($N = 5,406$). All subjects were enrolled in their respective plan (S/HMO or TEFRA HMO) for the entire first year of observation.

There are three primary data sources for the analysis: beneficiary surveys, expenditure data, and member records.

Beneficiary Survey Data

Beneficiary surveys were administered by mail at the midpoint of the 2 years of expenditure data. (The survey instrument was the Health Status Form survey used in the original S/HMO sites. The same survey instrument was administered to both

the S/HMO and TEFRA HMO enrollees.) The surveys covered comparative health rating (excellent, good, fair, poor), whether health conditions were getting worse, standard ADL and IADL questions, and questions regarding the need for special equipment. The surveys also contain information on enrollees' chronic conditions. Chronic conditions included in the analysis are: diabetes, high blood pressure, heart trouble, stroke, lung/breathing problems, chronic cough, circulation problems, stomach/bowel problems, urinary problems (bladder), arthritis or rheumatism, Parkinson's disease, and other health conditions.

The beneficiary survey also included questions about the respondent's functional status, specifically, the respondent's need for help performing any of the following activities:

- Using the toilet in the bathroom (TOILET).
- Bathing (including sponge baths) (BATH).
- Dressing (DRESS).
- Eat (EAT).
- Getting in or out of bed or using stairs (MOVE).

The possible responses were "most of the time," "some of the time," or "no." The data were transformed so that the first two responses were coded 1 and "no" was coded zero. Then a modified Katz score (Katz et al., 1963) was constructed as follows:

1. If all variables = 0, Katz score = 0.
2. If BATH = 1 and all other variables = 0, Katz score = 1.
3. If BATH and DRESS = 1 and all other variables = 0, Katz score = 2.
4. If BATH, DRESS, and TOILET = 1 and all other variables = 0, Katz score = 3.
5. If all variables except EAT = 1, Katz score = 4.
6. If all variables = 1, Katz score = 5.

Two measures of self-reported general health status were available in the data. The first question asked "Compared to other persons your age, would you say your health is: excellent (= 1), good (= 2), fair (= 3), or poor (= 4)?" The second question asked: "Compared to 1 year ago, how would you rate your health in general now: Better now than 1 year ago (= 1), about the same (= 2), or worse than 1 year ago (= 3)?" Thus, for both measures, higher scores indicate worse health status. The survey also included information on marital status and income.

The S/HMO surveys used in this analysis were mailed from January to December, 1990, and the TEFRA HMO surveys were all mailed in February, 1990. Of the 2,765 eligible enrollees, there were 2,444 usable responses, for an effective response rate of 88.4 percent. Of the 5,406 TEFRA HMO enrollees, there were 5,110 usable surveys, for an effective response rate of 94.5 percent. Thus, the total number of observations available for the analysis was 5,110 TEFRA HMO enrollees plus 2,443 S/HMO enrollees, or 7,553.

Expenditure Data

Data on expenditures come from the GHI database and are available for all TEFRA HMO and S/HMO enrollees. Expenditure data were available for five categories of services: (1) inpatient services; (2) nursing home services; (3) non-inpatient services covered by both the S/HMO and TEFRA HMO; (4) all services covered by both the S/HMO and TEFRA HMO; and (5) all services, including those covered only by the S/HMO. The expenditure data were subjected to two types of audits, audits for benefit errors (i.e., coordination of benefits) and audits for clerical accuracy (e.g., medical coding and dates of service).

Data for the TEFRA HMO enrollees cover 1 year before and 1 year after February, 1990. Data for the S/HMO enrollees cover 1 year before and 1 year after the date of the survey, which could range from January, 1990, to December, 1990.

Expenditures were summed over the 2 years of data. Two years of expenditure data provide an important advantage over 1 year, because expenditures are less influenced by random illnesses and injuries. To be sure that the expenditure data were complete, a 9-month lag past the close of an observation period was allowed for expenditure data to appear in the GHI expenditure data system.

The expenditure data for contracted services (inpatient care and other services obtained from providers outside GHI) represent actual amounts paid for services. Expenditures for services obtained from providers within GHI were imputed, using a fee schedule developed by GHI for internal management purposes. The same fee schedule was applied to services used by both S/HMO and TEFRA HMO enrollees.

Member Records

Member records provided data indicating whether the individual died or disenrolled from the health plan during the second year of the study. Both death and disenrollment during the second year are controlled in our regressions, despite the fact that attrition from both the S/HMO and TEFRA HMO samples was minimal. In our sample of 7,553 enrollees, 20 S/HMO enrollees and 15 TEFRA HMO enrollees died during the second year of observation. The disenrollment rate was approximately 0.1 percent in both samples ($N = 20$ in the S/HMO and $N = 72$ in the TEFRA HMO).

ESTIMATION

The purpose of this study is to evaluate the effect of S/HMO membership on health care expenditures. We use a multivariate regression model to control for the effects of confounding variables. We include explanatory variables to control for the subject's age, marital status, income level, number of chronic illnesses, self-reported general health and functional status, the month the interview took place (which varied only for S/HMO enrollees), and mortality and disenrollment during the second year of observation.

A number of potential estimation problems must be considered. First, and most important, subjects are not assigned randomly to the S/HMO and TEFRA HMO plans. For example, subjects with high anticipated demand for S/HMO-specific services might be more likely to enroll in the S/HMO. (Self-selection on the basis of anticipated service use would necessarily be limited to the use of S/HMO-specific services, because the coverage of benefits and the providers who deliver them are otherwise identical in the two plans.) In that case, there could be unobserved demand-related variables associated with both the choice of the S/HMO versus TEFRA HMO and subsequent expenditures in both plans. Those omitted variables could bias the estimated effect of S/HMO membership on expenditures. However, if subjects were choosing the S/HMO systematically, in anticipation of high use of S/HMO-specific services, we probably should observe more than 24 percent of S/HMO enrollees using S/HMO-specific services. In any case, the type of variable most likely to influence both health plan choice and expenditures in this way would be the subject's health and func-

tional status. Fortunately, we have several different measures of health and functional status in the data. We have data on the number of chronic conditions, the patient's self-reported health and functional status, and the change in self-reported health status over the previous year for each patient.

We were concerned that some of the health- and functional-status measures might be endogenous, that is, they might be affected by joining the S/HMO versus the TEFRA HMO. The chronic-illness measures are less likely to be endogenous because they represent long-term illnesses, but the reporting of those illnesses could be different if enrollees in one plan were more likely to report chronic conditions or if providers of S/HMO services were more likely to detect certain illnesses or to refer to them by particular names in discussions with enrollees. (We were careful to ask whether a particular condition was present, rather than whether the respondent was bothered by the condition, because the latter response might be a function of successful treatment of the condition.) The self-reported measures of general health status, change in health status, and functional status are more likely to reflect the way in which particular conditions have been handled by the health plan, and thus more likely to be endogenous. Inappropriate inclusion of endogenous health- and functional-status measures could bias our estimate of the S/HMO effect on expenditures by inadvertently controlling away part of the effect we are trying to detect. We test the sensitivity of our results to inclusion of the endogenous health- and functional-status variables by reporting results controlling only for chronic illnesses, then reporting results controlling for all the self-reported health- and functional-status measures.

The second estimation problem is that for some types of care (i.e., hospital and nursing home services) a significant proportion of enrollees may use no health care services during the observation period. Ordinary least squares (OLS) estimates of equations, based on data with a high proportion of observations at a limiting value, will result in inconsistent parameter estimates. To address this problem, we estimated two-part models for hospital and nursing home expenditures consisting of a logit equation for whether the subject had any expenditures, followed by an OLS equation for the amount of expenditures, conditional on expenditures being greater than zero.

The third problem is that the distribution of the error terms from an OLS regression based on enrollees with positive expenditures was skewed (non-normal). This problem could result in biased OLS estimates of the standard errors of the estimated parameters for positive users. To address this problem, we transformed the positive expenditure data by taking the natural log of expenditures, as follows:

$$S = \exp [X\beta + \beta_{S/HMO} S/HMO + \sigma u]$$

or:

$$\ln(S) = X\beta + \beta_{S/HMO} S/HMO + \sigma u$$

This semi-log transformation significantly reduced the skewness and has the added advantage of allowing us to interpret the coefficient on the S/HMO membership variable as the percent change in expenditures attributable to S/HMO membership, as follows:

$$\frac{S_{S/HMO} - S_{TEFRA}}{S_{TEFRA}} = \frac{e^{X\beta + \beta_{S/HMO} + \sigma u} - e^{X\beta + \sigma u}}{e^{X\beta + \sigma u}} = e^{\beta_{S/HMO}} - 1$$

Table 2
Definitions for Variables Other than Health and Functional Status

Variable	Definition
AGE	Enrollee's age as of February, 1990.
MALE	1 if enrollee is male, 0 if female.
MARRIED	1 if enrollee is married, 0 otherwise.
WIDOWED	1 if enrollee is widowed, 0 otherwise.
DIV_SEP	1 if enrollee is divorced, 0 otherwise.
INCOME_3-6	1 if enrollee family income is between \$3,000 and \$5,999, 0 otherwise.
INCOME_6-10	1 if enrollee family income is between \$6,000 and \$9,999, 0 otherwise.
INCOME_10-15	1 if enrollee family income is between \$10,000 and \$14,999, 0 otherwise.
INCOME_15-25	1 if enrollee family income is between \$15,000 and \$24,999, 0 otherwise.
INCOME_25+	1 if enrollee family income is greater than \$25,000, 0 otherwise.
SSI	1 if enrollee receives Supplemental Security Income, 0 otherwise.
LIVED	1 if enrollee was alive throughout the second year of observation, 0 otherwise.
MARRY_MISS	1 if data on marital status were missing, 0 otherwise.
SSI_MISS	1 if data on SSI status were missing, 0 otherwise.
LIVED_MISS	1 if data on death were missing, 0 otherwise.
DISVAR	1 if enrollee was not enrolled in the same plan throughout the study period (while alive), 0 otherwise.
NUMCOND	Number of chronic conditions.
CHRONIC_MISS	1 if data on chronic conditions were missing, 0 otherwise.
MONTHINT	The month of the interview, which determines the "window" of expenditure data. January = 1, February = 2, etc. (MONTHINT = 2 for all TEFRA HMO enrollees).

NOTES: TEFRA is Tax Equity and Fiscal Responsibility Act of 1982. HMO is health maintenance organization.

SOURCE: Dowd, B., et al., Minneapolis, Minnesota, 1999.

Kennedy (1981) notes that a consistent estimate of the percent change in expenditures attributable to S/HMO membership requires the further adjustment:

$$\exp[\beta_{S/HMO} - \frac{1}{2} \sigma^2 \beta_{S/HMO}] - 1$$

As a data-confidentiality condition, GHI encrypted the expenditure data by multiplying each individual's expenditures by a scaling factor, constant across both S/HMO and TEFRA HMO samples, that was unknown to the analysts. The scaling constant is absorbed into the intercept term in the regression and does not affect the interpretation of the coefficient of S/HMO as a percent change in expenditures attributable to S/HMO versus TEFRA HMO membership.

RESULTS

Table 2 gives the definitions of the variables in the analysis and Table 3 shows the means and standard deviations of the variables. In some specifications of the estimated equations, measures of health and functional status were included. Table 4 shows the

means of the health- and functional-status variables for S/HMO and TEFRA HMO enrollees. The proportion of enrollees with a Katz score greater than one was higher among S/HMO enrollees. S/HMO enrollees were more likely to report fair or poor health status than TEFRA HMO enrollees. S/HMO enrollees were less likely to report that their health status was the same as the previous year. They were more likely than TEFRA HMO enrollees to report both improvements and decrements in health status.

The dependent variables in the analysis are five categories of expenditures: (1) nursing home; (2) inpatient; (3) non-inpatient services covered by both the S/HMO and TEFRA HMO; (4) expenditures on all services covered by both the S/HMO and TEFRA HMO; and (5) expenditures on all services covered by both plans plus total expenditures including S/HMO-specific services for S/HMO enrollees.

Services covered by both the S/HMO and TEFRA HMO are Medicare-covered nursing home services, inpatient, GHI clinic, pharmacy, audiology, Medicare-covered home care, ambulance, Medicare-covered

Table 3
Means and Standard Deviations for Variables Other than Health and Functional Status

Variable	S/HMO ¹		TEFRA ²	
	Mean	Standard Deviation	Mean	Standard Deviation
AGE	74.345	6.5380	72.735	5.6324
MALE	0.38436	0.48654	0.46536	0.49885
MARRIED	0.56324	0.49609	0.63620	0.48114
WIDOWED	0.32501	0.46847	0.26047	0.43893
DIV_SEP	0.060991	0.23936	0.066536	0.24924
INCOME_3-6	0.12116	0.32638	0.13738	0.34428
INCOME_6-10	0.21326	0.40970	0.23992	0.42708
INCOME_10-15	0.27835	0.44828	0.26673	0.44229
INCOME_15-25	0.12239	0.32780	0.11076	0.31387
INCOME_25+	0.098240	0.29770	0.077495	0.26740
SSI	0.098240	0.29770	0.13151	0.33799
LIVED	0.96521	0.18329	0.97847	0.14515
MARRY_MISS	0.017601	0.13152	0.0060665	0.077659
SSI_MISS	0.075317	0.26396	0.064775	0.24615
LIVED_MISS	0.011871	0.10833	0.0029354	0.054105
DISVAR	0.0081867	0.090127	0.014090	0.11787
NUMCOND	1.7274	1.5160	1.5274	1.4193
CHRONIC_MISS	0.014736	0.12052	0.014677	0.12027
MONTHINT	5.9329	1.2252	2.0000	0.0000

¹ N = 2,443.

² N = 5,110.

NOTES: S/HMO is social health maintenance organization. TEFRA is Tax Equity and Fiscal Responsibility Act of 1982.

SOURCE: Dowd, B., et al., Minneapolis, Minnesota, 1999.

durable medical equipment, laboratory, clinic expenditures, outpatient, and other facility costs. As noted previously, services covered only by the S/HMO (referred to as S/HMO-specific services) are LTC home services, special durable medical equipment and medical transportation, and day care services.

To conserve space, we summarize the regression results in Table 5. Table 6 shows a complete set of coefficients for the dependent variable “expenditures covered by both the S/HMO and TEFRA HMO.” The first result for each expenditure category in Table 5 controls for the number of chronic conditions, along with the other explanatory variables, but not the self-reported general health- and functional-status variables. The second result controls for the self-reported general health- and functional-status variables, as well as the number of chronic conditions. All coefficients are significant at the 0.05 level, minimum, unless marked NS (not significant).

In the logit analyses of some versus no nursing home and inpatient expenditures, the S/HMO coefficient is exponentiated to obtain the change in the odds ratio of “some” expenditures associated with membership in the S/HMO versus TEFRA HMO. In the remaining OLS equations, the Kennedy correction is applied to the S/HMO coefficient to obtain the percent change in expenditures associated with membership in the S/HMO versus TEFRA HMO.

As shown in Table 5, membership in the S/HMO is associated with a greater probability of using both nursing home and inpatient services. The effect on the level of nursing home expenditures for those with positive nursing home expenditures is significant as well. Expenditures on inpatient services for those with positive inpatient expenditures are not significantly different for S/HMO and TEFRA HMO enrollees.

The next set of results compared the S/HMO effect on expenditures for services covered by both the S/HMO and

Table 4
Variable Definitions and Means for Health- and Functional-Status Measures

Variable	Definition	S/HMO	TEFRA
		Mean	
KATZ0	1 if the subject's Katz score = 0.	0.90217	0.954599
KATZ1	1 if the subject's Katz score = 1.	0.02865	0.014090
KATZ2	1 if the subject's Katz score = 2.	0.00819	0.002740
KATZ3	1 if the subject's Katz score = 3.	0.00123	0.000391
KATZ4	1 if the subject's Katz score = 4.	0.00860	0.005675
KATZ5	1 if the subject's Katz score = 5.	0.02170	0.007241
OTR1	1 if the subject reports that their health status, compared with other people they know, is excellent.	0.19689	0.19843
OTR2	1 if the subject reports that their health status, compared with other people they know, is good.	0.54441	0.59237
OTR3	1 if the subject reports that their health status, compared with other people they know, is fair.	0.20835	0.17965
OTR4	1 if the subject reports that their health status, compared with other people they know, is poor.	0.03643	0.01742
PREV1	1 if the subject reports that their health status, compared with the previous year, is better.	0.10356	0.06086
PREV2	1 if the subject reports that their health status, compared with the previous year, is the same.	0.68236	0.78689
PREV3	1 if the subject reports that their health status, compared with the previous year, is worse.	0.14531	0.07984
KATZMIS	1 if data on ADLs are missing.	0.02947	0.01526
OTRMIS	1 if data on health status, compared with other people you know, are missing.	0.01392	0.01213
PREVMIS	1 if data on health status, relative to the previous year, are missing.	0.06877	0.07241

NOTES: S/HMO is social health maintenance organization. TEFRA is Tax Equity and Fiscal Responsibility Act of 1982. ADLs is activities of daily living.

SOURCE: Dowd, B., et al., Minneapolis, Minnesota, 1999.

TEFRA HMO with the S/HMO effect on total expenditures. Services common to both the S/HMO and TEFRA HMO, excluding inpatient services, are about 16 percent higher for S/HMO enrollees, whereas expenditures on all common services are 18-19 percent higher for S/HMO enrollees. Expenditures on all services, including S/HMO-specific services for S/HMO enrollees, are about 20-22 percent higher for S/HMO enrollees. In the regressions that include the health- and functional-status variables, the ADL variables generally were insignificant, but the health-status variables were highly significant in all equations. This is not surpris-

ing, given the lack of variance in the ADL measures compared with the health-status measures (Table 4). Interestingly, with the exception of the probability of some nursing home expenditures, the addition of the health- and functional-status variables makes very little difference in the results. It also is interesting to note that the minor differences in the S/HMO coefficients caused by the additional variables are not always in the same direction.

As a final test of the validity of the model and data, we estimated the effect of S/HMO membership on expenditures covered by both the S/HMO and TEFRA HMO for subjects who did not use any

Table 5
Summary Table of Statistics on S/HMO Effect

Expenditure Category	Odds Ratio	Percent Difference in Expenditures
Probability of some nursing home expenditures	1.84	—
With health- and functional-status variables	1.49	—
Expenditures on missing home services for subjects with some expenditures	—	+80.2
With health- and functional-status variables	—	+81.6
Probability of some inpatient expenditures	1.26	—
With health- and functional-status variables	1.22	—
Expenditures on inpatient services for subjects with some expenditures	—	+7.35 (NS)
With health- and functional-status variables	—	+5.36 (NS)
Expenditures on non-inpatient services covered by both the S/HMO and TEFRA HMO	—	+15.9
With health- and functional-status variables	—	+15.4
Expenditures on all services covered by both the S/HMO and TEFRA HMO	—	+19.2
With health- and functional-status variables	—	+17.9
Total expenditures (including S/HMO-specific services for S/HMO enrollees)	—	+21.7
With health- and functional-status variables	—	+20.1

NOTES: S/HMO is social health maintenance organization. TEFRA is Tax Equity and Fiscal Responsibility Act of 1982. NS is not significant.

SOURCE: Dowd, B., et al., Minneapolis, Minnesota, 1999.

S/HMO-specific services, controlling for the same variables as in the previous runs. We would expect the estimated effect to be zero, since the S/HMO and TEFRA HMO plans were identical for subjects who did not use S/HMO-specific services. As expected, the estimated effect of S/HMO membership for these subjects was numerically small ($\beta = -0.020$) and statistically insignificant ($\alpha = 0.727$).

SUMMARY AND CONCLUSIONS

The overall conclusion of the analyses is that membership in the S/HMO versus the TEFRA HMO is associated with increased expenditures. There is no evidence of overall savings associated with S/HMO membership, and no evidence of successful substitution of S/HMO-specific services for other, traditional services covered by both the S/HMO and the TEFRA HMO. OLS estimates of the effect of S/HMO enroll-

ment on total expenditures is about +20 to +22 percent. For services covered by both the S/HMO and TEFRA HMO, the effect is about +18 to +19 percent. The effect on non-inpatient expenditures covered by both plans is about +15 to +16 percent. All these effects are statistically significant.

The odds of having some inpatient expenditures increases by about 26 percent with S/HMO membership in simple logistic regressions and is statistically significant. The effect of S/HMO membership on inpatient expenditures for subjects with some inpatient expenditures is not statistically significant.

The positive effect of S/HMO membership on expenditures is confined to the 24 percent of S/HMO members who received S/HMO services. There is no S/HMO effect on the expenditures of S/HMO enrollees who did not receive S/HMO-specific services.

Table 6
Expenditures for Services Covered by Both the S/HMO and TEFRA HMO

Variable	Coefficient	t-ratio	Prob t ≥x
Constant	6.9030	22.199	0.00000
AGE	0.020122	6.153	0.00000
MALE	0.0067761	0.168	0.86671
MARRIED	0.64398	6.038	0.00000
WIDOWED	0.58201	5.354	0.00000
DIV_SEP	0.74474	5.915	0.00000
INCOME_3-6	0.061841	0.907	0.36467
INCOME_6-10	0.034565	0.583	0.55972
INCOME_10-15	0.037919	0.641	0.52150
INCOME_15-25	0.13003	1.790	0.07340
INCOME_25+	0.15757	1.968	0.04909
SSI	-0.026602	-0.472	0.63713
LIVED	-1.2302	-9.329	0.00000
MARRY_MISS	0.77619	3.619	0.00030
SSI_MISS	0.023716	0.319	0.74954
LIVED_MISS	-1.0064	-3.700	0.00022
DISVAR	-0.74460	-4.478	0.00001
MONTHINT	0.012963	1.522	0.12803
NUMCOND	0.36813	28.439	0.00000
CHRONIC_MISS	-0.10597	0.1555	0.49556
SHMO	0.17713	3.412	0.00065
With health- and functional-status variables included on the righthand side:			
SHMO	0.16593	3.222	0.00127

NOTES: Adjusted $R^2 = 0.140$. F -statistic = 62.43. $N = 7,553$. S/HMO is social health maintenance organization. TEFRA is Tax Equity and Fiscal Responsibility Act of 1982.

SOURCE: Dowd, B., et al., Minneapolis, Minnesota, 1999.

What are the possible explanations for increased spending in the S/HMO? It is possible that S/HMO membership led to increased salience of medical problems for enrollees receiving the extended care benefit. That is, the care coordinators and home care workers might have discovered health problems that otherwise would have gone undetected, recommended medical attention for chronic problems, and helped to link patients with other medical providers. In addition, the transportation benefit may have improved access to physicians and clinics. The results suggest that S/HMO membership increased outpatient expenditures by about 16 percent.

There also might have been indirect S/HMO effects on the health care system. When care coordinators were involved with a special case, physicians might have become more attentive to those patients and more likely to treat borderline conditions. Although S/HMO and TEFRA HMO

enrollees all had access to the same pool of physicians, there could be differences in the practice patterns of specific physicians seen by S/HMO and TEFRA HMO enrollees. Also, our measures of health and functional status may not have corrected entirely for omitted-variables bias.

The finding that S/HMO membership results in higher expenditures does not imply that the S/HMO failed to provide services valued by its members. Indeed, a qualitative study of the termination of the S/HMO in Minnesota found that at-risk elderly were receiving fewer home care services, their family caregivers reported increased burden and stress, and they had more out-of-pocket expenses (Fischer et al., 1998). However, valued services must be financed in some manner. The S/HMO could have remained a viable product in the market if the combination of the Federal capitation payments and consumer out-of-pocket premiums were sufficient to

sustain the product in the market. However, after a number of changes in the S/HMO and TEFRA HMO products (including dropping outpatient prescription drug coverage from the TEFRA HMO product and adding it to the S/HMO product), the S/HMO was terminated by GHI on December 31, 1994, and enrollees were given a choice between the TEFRA HMO and a health care prepayment plan. Although many factors influenced the decision to terminate the S/HMO, GHI's experience suggests that the combination of the Federal capitation rate and beneficiary out-of-pocket premiums did not provide sufficient revenue to sustain the S/HMO product in the market.

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REFERENCES

- Abrahams, R., Capitman, J.A., Leutz, W.N., and Macko, P.: Variations in Care Planning in the Social/HMO: A Qualitative Study. *Gerontologist* 29(6), December 1989.
- Berkeley Planning Associates: *Final Report: Evaluation of the Access Medicare Long-Term Care Demonstration Project*. Berkeley, CA. August, 1987.
- Capitman, J.A.: Community-Based Long-Term Care Models, Target Groups, and Impacts on Service Use. *Gerontologist* 26(4):389-397, August 1986.
- Eggert, G., and Friedman, B.: The Need for Special Interventions for Persons at Risk of Multiple Hospital Admissions. *Health Care Financing Review (Annual Supplement)*:57-68, 1988.
- Fischer, L.R., Leutz, W., Wisner, C., et al.: The Closing of a Social HMO. *The Journal of Aging and Social Policy* 10(1):57-75, 1998.
- Harrington, C., and Newcomer, R.J.: Social Health Maintenance Organizations as Innovative Models to Control Cost. *Generations* 14(2):49-54, 1990.
- Harrington, C., Newcomer, R.J., and Preston, S.: A Comparison of S/HMO Disenrollees and Continuing Members. *Inquiry* 30(4):429-440, Winter 1993
- Health Care Financing Administration: *Status Report on the Implementation and Evaluation of the Social Health Maintenance Organization Demonstration*. Report to Congress. Office of Research and Demonstrations. Baltimore, MD. 1996.
- Hughes, S.L., Ulasevich, A., Weaver, F.M., et al.: Impact of Home Care on Hospital Days: A Meta Analysis. *Health Services Research* 32(4):415-432, October 1997.
- Katz, S., Ford, A.B., Moskowitz, R.W., et al.: Studies of Illness in the Aged: The Index of ADL. *Journal of the American Medical Association* 183(12):914-919, September 21, 1963.
- Kemper, P., Applebaum, R.A., and Harrigan, M.: Community Care Demonstrations: What Have We Learned? *Health Care Financing Review* 8(4):87-100, Summer 1987.
- Kennedy, P.E.: Estimation with Correctly Interpreted Dummy Variables in Semilogarithmic Equations. *American Economic Review* 71(4):801, September, 1981.
- Leutz, W.N., Greenberg, R., Abrahams, R., et al.: *Changing Health Care for an Aging Society: Planning for the Social/HMO*. Lexington, MA. Lexington Books, D.C. Heath & Company, 1985.
- Manton, K.G., Newcomer, R., Lowrimore, G.R., and Vertrees, J.C.: Prior and Current Costs in Capitated Plans. *Journal of Aging and Health* 8(2):183-206, May, 1996.
- Newcomer, R.J., Harrington, C., and Friedlob, A.: Social Health Maintenance Organizations. *Health Services Research* 25(3):425-454, August 1990.
- Weissert W.G., Gredy, C.M., Pawelak, J.E.: The Past and Future of Home- and Community-Based Long-Term Care. *The Milbank Quarterly* 66:309-388, 1988.

Weissert, W.G., and Hedrick, S.C.: Lessons Learned from Research in Effects of Community-Based Long-Term Care. *Journal of the American Geriatric Society* 3(345):348-353, March 1994.

Yordi, C.: Case Management in the Social Health Maintenance Organization Demonstrations. *Health Care Financing Review (Annual Supplement)*:83-88, 1988.

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